North Carolina Space Grant Consortium (NCSG)
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Director: Christopher S. Brown
Telephone Number: 919-515-4240
URL: http://ncspacegrant.org
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The North Carolina Space Grant Consortium is a Designated Consortium funded at a level of **$575,000** for fiscal year 2011.

PROGRAM GOALS

North Carolina Space Grant's goals and objectives (listed below) are part of the Consortium's five-year strategic plan (FY2010-14) and are aligned with NASA's Education Framework:

Goal 1: To deliver a competitive Fellowship/Scholarship program that provides research and education opportunities to students in science, technology engineering, and mathematics (STEM) disciplines at NCSG Affiliate institutions. (NASA Outcome 1)

Objectives: (1.1) Support Graduate Research Fellowships and Undergraduate Research Scholarships; (1.2) Support Undergraduate Scholarships; (1.3) Support Community College Scholarships; (1.4) Support STEM Teacher Education Scholarships; (1.5) Ensure competitive distribution of F&S funds; (1.6) Leverage support from industry, research organizations, and other Space Grant partners for other F&S projects.

Goal 2: To strengthen North Carolina's aerospace-related research infrastructure and capabilities. (NASA Outcome 1)

Objectives: (2.1) Provide start-up funding to early career faculty; (2.2) Encourage research collaborations between faculty and NASA centers/industry; (2.3) Ensure competitive distribution of research funds.

Goal 3: To provide groups of students with opportunities to engage in NASA-mission and STEM-based academic research and coursework. (NASA Outcomes 1 and 2)

Objectives: (3.1) Engage student groups in NASA-related research/design projects; (3.2) Develop STEM courses aligned with NASA's research direction and corresponding Mission Directorates; (3.3) Ensure competitive distribution of higher education funds.

Goal 4: To deliver activities that facilitate the National Space Grant College and Fellowship Program's focus on involving underrepresented groups and persons with disabilities in all higher education program areas.

Objective: (4.1) Pursue and increase the participation of women, underrepresented minorities, and persons with disabilities in NC Space Grant program areas of Fellowship/Scholarship, Student Research and Course Development, and Research Infrastructure.

Goal 5: To equip NC pre-service and in-service educators with tools to inspire the future STEM workforce to pursue education and careers in aerospace-related fields. (NASA Outcome 2)

Objectives: (5.1) Provide professional development opportunities for precollege educators; (5.2) Ensure competitive distribution of precollege education funds.

Goal 6: To increase interest in and understanding of NASA-mission and STEM activities by inspiring and engaging individuals of all ages throughout North Carolina. (NASA Outcome 3)

Objectives: (6.1) Provide professional development opportunities for informal educators; (6.2) Ensure competitive distribution of informal education funds.

Goal 7: To expand the geographic diversity and awareness of NC Space Grant.

Objectives: (7.1) Increase the number of Affiliates and Partners; (7.2) Increase the funding base for NCSG to allow for expanded programming; (7.3) Increase public awareness of NCSG activities.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

The following anecdotes demonstrate the impact of NC Space Grant programs on all learners in North Carolina:

Outcome 1 – Fellowship and Scholarship:

Neil Taylor, 2011 NC Space Grant Community College Scholarship to participate in the NASA Lunar and Planetary Science Academy (LPSA):

"Before I returned to college I worked for thirteen years as a Harley Davidson Motorcycle technician. For quite a while I believed I was too old to return to school. With the help of some fantastic mentors, I became convinced that I could not only return to school, but I could also excel. I began my college experience attending Mitchell Community College in Statesville, NC. My educational goal was to complete an associate degree at Mitchell before attending a university to earn a BS in electrical engineering.

My sophomore year at Mitchell caused a major change in my life. Up until this point I was unsure what I wanted to do with the engineering degree I was working towards. As part of physics class, I participated in the NASA University Student Launch Initiative

(USLI). This experience opened up a whole new world for me. Our NASA USLI project was a success; not only did it expose me to NASA engineering processes it also encouraged me to apply for additional NASA opportunities. I also had the opportunity to participate in NASA's Community College Aerospace Scholars (NCAS) program. NCAS was fantastic engineering challenge that earned me a spot at the NCAS three-day engineering competition at JPL. In addition to NCAS and USLI, I was accepted for the 2011 NASA LPSA at Goddard Space Flight Center (GSFC) and my participation was funded by the NC Space Grant. These NASA programs changed my life. Before these NASA experiences, especially the LPSA internship, I was unsure what I wanted to do and had settled for the relatively mundane career goal of working for the local utility in power generation. After these NASA programs I wanted more for my family and myself. In 2011 I applied for and was awarded the Department of Defense SMART scholarship. I am now working towards a career with the federal government. My involvement with NASA continues to this day. In 2012 I was named an NASA student ambassador.

I owe a great debt to those that have encouraged me in my academic endeavors, and I owe an even greater debt to those that have exposed me to these NASA opportunities. Without the aid of NC Space Grant my internship at GSFC would not have been possible, and without NC Space Grant my future might be significantly different. I believe that without my LPSA internship, and NC Space Grant's support, I might not been selected for the highly competitive SMART program. Without SMART I would be unable to afford a university education.

I graduated with high honors from Mitchell Community College with an Associate in Science, and am now a junior at UNC-Charlotte studying Electrical Engineering. I believe what NASA and Space Grant is accomplishing through their educational programs is extremely important for the future of this country. *I know that they have been instrumental in shaping my future*."

Outcome 1 – Research Infrastructure:

Dr. Imara Perera, FY2006 New Investigator award recipient and Assistant Professor of Plant Biology at NC State University, is the Principal Investigator on a plant biology experiment that is currently funded by NASA ($445,812; NASA Grant NNX10AM72G). Her experiment was delivered to the International Space Station on Space Shuttle Atlantis as part of final shuttle mission (STS-135) in the summer of 2011. This research is an extension of the work she conducted as a New Investigator studying the molecular mechanisms of plant biochemical signaling in response to gravity. The on-orbit component of the experiment was carried out successfully in the summer of 2011, and the frozen specimens remain on the ISS until their return on theDragon vehicle by SpaceX, expected to be launched later this year. Preliminary results will be presented at the ISS Research and Development Conference in Denver in June 2012 (http://iss-casis.org/event_issConf.php) and Dr. Perera was recently interviewed for an article in *Nature* regarding the experiments delayed return to earth following the retirement of the shuttle program. (http://www.nature.com/news/space-station-rendezvous-set-to-spur-research-push-1.10501).

Outcome 2 – Pre-college Education Program:

Dr. Rita Fuller, Director of the NC Mathematics and Science Education Network Pre-College Program:

"UNC-Pembroke's *Bringing Robotics into the Classroom* professional development program has greatly benefitted K-12 students and teachers, particularly North Carolina Mathematics and Science Education Network (NC-MSEN) Pre-College Program (PCP) students from underrepresented and underserved populations who tend to have limited exposure to and opportunities for participation in science- and mathematics-related competitions, particularly robotics. Through this professional development, the NC-MSEN PCP has a cadre of teachers and staff who are highly trained to deliver robotics instruction to middle and high schools students. Consequently, the NC-MSEN PCP can now serve as a recruiting pool for participants to advance and showcase their engineering design skills at statewide robotics competitions."

PROGRAM ACCOMPLISHMENTS

Below is a summary of NC Space Grant's FY 2011 program accomplishments as they relate to the NASA Education Strategic Framework Outcomes. It is important to note that all NCSG funded projects will conclude June 30, 2012. Affiliate data that is presented in this APD report is an approximation based on the activity proposed by the Affiliate institution.

NASA EDUCATION OUTCOME 1:

Fellowships and Scholarships

NC Space Grant competitively awarded 64 fellowships and scholarships to students at Affiliate institutions.

- Awarded 11 Graduate Research Fellowships and 19 Undergraduate Research Scholarships to students representing all of the university Affiliates. Six of these research projects had significant partnerships with NASA centers that included a NASA research mentor and the students working on-site at the following NASA centers: JPL, Ames (NASA Academy), Goddard (NASA Academy), Glenn (NASA Academy), Langley (NASA LARSS); one student participated in the NASA Lunar Science Institute in Boulder, Colorado (SMD/SG pilot internship program).
- NC Space Grant continued its partnership with the LORD Corporation to offer a summer internship program for undergraduate and graduate students. LORD is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies. NCSG leveraged funding from LORD to provide support for 8 students (counted in F/S student data) to participate in a 10-week internship at LORD. *One of these students, who graduated from NC State University in May 2012, was hired full-time and selected to participate in LORD's Leadership Development Program. Furthermore LORD is supporting his graduate studies in Engineering Management at Duke University.*
- Awarded 10 Undergraduate Scholarships, 13 Community College STEM Scholarships, and 3 NCSG/ Women in Science and Engineering (WISE) Scholarships enabling lower division students an opportunity to explore STEM-related research on their campus.

NCSG Fellowship and Scholarship programs contributed to NCSG Goal 1. All Goal 1 Objectives, with the exception of Objective 1.4, were exceeded or met in FY11. Objective 1.4 results are not reflected in this report because those students were supported through FY11 augmentation funds.

Research Infrastructure

Four 'New Investigators' awards were competitively granted to early career university faculty who are conducting research that is directly aligned with NASA's research direction. All projects involved undergraduate and/or graduate students, which provided practical training to students as well as opportunities to present research at professional conferences (8 students engaged through New Investigators program).

- Dr. Suzanna Brauer, Department of Biology, Appalachian State University, *Microbial Signatures as a Tool to Aid the Search for Life in the Universe* (3 students supported)
- Dr. Sarah Carmichael, Department of Geology, Appalachian State University, *Mn Oxides as Biosignatures in Subsurface Environments* (2 students supported)
- Dr. Jonathan Bird, Department of Electrical and Computer Engineering, UNC-Charlotte, *Electromagnetic Launch Assistance for Space Vehicles Using Electrodynamic Wheels* (1 student supported)
- Dr. Fei Yan, Department of Chemistry, NC Central University, *Surface Plasmon-based Colorimetric Detection of Reactive Oxygen Species: Assessing Radiation Damage to Astronauts on Extended Space Missions* (2 students supported)

NC Space Grant Affiliates supported an additional 36 students involved in STEM-related research on their respective campuses through research assistantships under the supervision of faculty (life science, earth science, chemistry and engineering) and NASA mentors (at Ames and JPL).

NC Space Grant Research Infrastructure programs contributed to NCSG Goal 2. Objective 2.1 was partially met due to a reduction in funding. Additional faculty were supported in their research efforts using FY11 Augmentation funds but are not reflected in this report. Objectives 2.2 and 2.3 were met.

Higher Education Programs

Three 'Higher Education/Course Development' awards were competitively granted in FY11 resulting in the development of one new course (remote sensing interdisciplinary course) and two enhanced courses (senior design in electrical engineering and undergraduate research in microgravity). A total of 26 students were engaged in Higher Education Course Development activities.

- Dr. Christopher Badurek, Department of Geography and Planning at Appalachian State University, developed an interdisciplinary undergraduate/graduate course (Land Cover Change Science) that focused on learning the principles of land cover change science using geospatial analysis and imaging processing of NASA's imagery. Student research projects with NASA data were focused on the impacts of land use land cover change in western North Carolina which helped inform approaches to mitigating negative impacts of development on the environment.

- Dr. Nan Bousaba. Department of Electrical Engineering at UNC-Charlotte, enhanced a multidisciplinary senior design capstone course to include the development of an autonomous robot with real-time bi-directional video and audio capabilities.
- Dr. Tim Ritter, Department of Chemistry at UNC-Pembroke, developed an interdisciplinary biotechnology special topics course for undergraduate students (science and non-science majors) to develop and conduct research as part of NASA's Reduced Gravity Student Flight Opportunities Program. The students spent the academic year researching human antigen and antibody reactions in microgravity. Unfortunately the team was not selected to fly on NASA's KC-135 in FY11.

NCSG Affiliates provided support for student groups to participate in a variety of higher education activities that emphasize student workforce development through the incorporation of interdisciplinary research collaboration. A total of 62 students participated in design competitions or interdisciplinary higher education projects.

- Support of Mitchell Community College's (MCC) participation in the NASA Undergraduate Student Launch Initiative (USLI) program. In 2009, MCC team became the first in the history of the NASA USLI program to represent a community college. The team placed 7th out of 22 university teams. In 2010, Mitchell returned and finished in 4th place out of 19 teams after successfully launching their rocket and scientific payload to an altitude of 4,444 feet. In 2011, MCC was one of three veteran teams to accept NASA's Level 2 challenge, which required teams to tackle new and tougher requirements (higher altitude, inclusion of a scientific payload, and a water landing). For Level 2, NASA extended invitations to teams that placed in the top five finalists in the last two years and only three teams accepted the challenge. MCC competed against the University of Alabama Huntsville (1st place in 2010) and Mississippi State (2nd place in 2010).
- Support for Mechanical Engineering students at NC A&T State University to participate in the 2011 Lockheed Martin/SAE Aero-Design East competition in Marietta, GA.
- Support for an undergraduate student at NC Central University to participate in the NASA Space Shuttle Symposium in Atlanta, Georgia in the summer of 2011. This symposium honored the accomplishment of the NASA Space Shuttle program and provided an overview of the technical and scientific advances made possible by the program.
- Support for multi-campus (UNC-Asheville and UNC-Pembroke) undergraduate research involving hands-on development and usage of instrumentation at the Pisgah Astronomical Research Institute (PARI). Faculty mentored students from majors that included physics, mathematics, computer science, and engineering. This interdisciplinary, hands-on approach allowed students to learn specific skills and teamwork approaches to problem solving.

NCSG Higher Education programs contributed to NCSG Goal 3. NCSG Objective 3.2 was partially met due to a reduction in funding. Additional higher education courses and projects were supported in using FY11 Augmentation funds but are not reflected in this report. Objectives 3.1 and 3.3 were met.

Of the 196 students supported in FY11, 59 (30.1%) went to students from historically underrepresented minority groups and 40 (25%) to females. *(NCSG Goal 4, Objective 4.1)*

- NCSG minority student participation exceeds the target of 28.3% set by the NCSG FY2010-14 Strategic Plan and is consistent with the enrollment percentage of minority students in NC (28.3%) as published in the National Center of Education Statistics Digest (U.S. Department of Education, 2008).
- The percentage of female participants fell short of the 55% target set by the NCSG 2010-14 Strategic Plan (Outcome Indicator: 55% of awards will be made annually to female applicants. The 55% target was derived from the enrollment of female students in NC degree-granting institutions as published by the National Center for Education Statistics (U.S. Department of Education, 2008).

  To help increase female participation, NCSG implemented the NCSG/WISE (Women in Science and Engineering) Scholarship program in FY10. This program provides freshman and sophomore level students a chance to engage in faculty-mentored research early in their career and participate in an experience that mirrors how science and engineering is done professionally. Three students were selected to participate in FY11. NCSG plans to work with the WISE director at NC State University to develop a strategy to increase participation in this program area.

NASA EDUCATION OUTCOME 2:

Three 'K-12 Professional Development' awards were competitively awarded in FY11. Funded projects involved collaboration with partners to achieve its strategic goals of equipping the future STEM workforce and enhancing precollege educator knowledge of aerospace issues.

- Dr. Cynthia Bickley-Green, School of Art and Design, East Carolina University, *Creative Leadership in STEM and Art Education* (40 pre/in service middle and high school teacher participants)
- Dr. Laurie McNeil, Department of Physics and Astronomy, UNC-Chapel Hill, *Symposium on Horizons in Astronomy and Physics Education* (30 in-service middle and high school teacher participants)
- Dr. Jose D'Arruda, Department of Physics, UNC-Pembroke, *Brining Robotics into the Classroom*, (15 in-service middle and high school teacher participants)

NCSG continued its partnership on a two-year NASA K-12 Cooperative Agreement Notice awarded to the NC Science, Mathematics and Technology Education Center (SMT Center) in 2010. *Flight Fellowships: STEM in Aerospace Science and Aeronautics* is an innovative professional development model brings together a coalition of high school teachers, research scientists and industry leaders in North Carolina. Twenty expert teachers in two cohorts were competitively selected to learn about contemporary aerospace science and develop innovative, locally relevant curriculum using NASA educational resources to motivate students to pursue STEM study and careers in aerospace. Each Flight Fellowship includes a mentored summer research externship,

professional development institutes, and a mid-year professional development workshop.

In spring 2011, nine teachers were selected in Cohort 1for Flight Fellowships at the following institutions: GE Aviation (Project: Scientific Principles of Engine Assembly); RDU Airport Authority (Project: Airport Engineering); Spirit Aerosystems, Inc. (Aviation and Aerospace Careers); Duke University (Project: Solar Energy for Space Travel); Center for Aviation Safety at NC A&T State University (Project: Aviation Safety); Wilkes Community College (Project: Aerospace Technology for STEM Education); Morehead Planetarium and Science Center at UNC-Chapel Hill (STEM Resources Library for Educators); Guilford Technical Community Colleges (Project: Building a Workforce in Aerospace and Aviation).

Eleven teachers have been selected for Cohort 2 Flight Fellowships; externships begin in the summer of 2012.

NCSG Affiliates provided support for NASA/STEM resource sharing and discipline training opportunities on their local campuses through activities such as teacher fellowships and interdisciplinary workshops. Projects included:

- Funding for one in-service teacher to work alongside Appalachian State University undergraduate students to conduct hands-on physics research.
- Earth Science professional development for five Elizabeth City State University pre-service science teachers and 5 in-service teachers.

NCSG precollege education program contributed to NCSG Goal 5. Objectives 5.1 and 5.2 were met.

NASA EDUCATION OUTCOME 3:

Four 'Informal Education and Public Outreach' awards were competitively awarded through partnerships with informal education venues and community groups.

- Dr. Anita Kitchens, Department of Mathematical Sciences at Appalachian State University, *Appalachian State University Math Camp at Discovery Place*
- Dr. Roger Narayan, Department of Biomedical Engineering, NC State University, *Science Saturday Program on Space Biology, Materials, and Medicine at the NC Museum of Natural Sciences*
- Dr. Tim Ritter, Department of Chemistry, UNC-Pembroke, *Using NASA's "Weightless Wonder" to Inspire North Carolina's American Indian Youth*
- Ms. Crystal Harden, Director of Outreach at Morehead Planetarium and Science Center at UNC-Chapel Hill, *NC3PO: North Carolina's Planets Promotes Proficiency and Opportunity* outreach to middle school students in underserved school districts

NCSG Affiliates provided funds to support local/regional events that engage students and the general public in STEM careers and NASA activities. Projects included:

- Support for aerospace activities onboard the NC Community College System's *Mobile Career Launch Pad,* a large mobile laboratory that visits middle schools, high schools and community colleges to promote the STEM education pathways critical to North

Carolina. The lab includes hands-on equipment, demonstrations, and computer-based 3-D simulation career exploration tools.

- Support for *e-Girls*, a program by Winston-Salem State University to motivate young girls to study math and science.

NCSG provided support for two visually impaired high school students to participate in the National Federation of the Blind's 2011 Youth Slam. This five-day academy engages and inspires the next generation of blind youth to consider careers in STEM. While staying on a college campus, students are mentored by blind role models during hands-on activities designed to build confidence and increase science literacy.

NCSG informal education and public outreach program contributed to NCSG Goal 6. Objectives 6.1 and 6.2 were met.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMACE MEASURES

- Student Data and Longitudinal Tracking: Total awards = 196; Fellowship/Scholarship = 60, Higher Education/Research Infrastructure = 136; 56 of the total awards represents underrepresented minority F/S and HE/RI funding. During the FY11 program year, 95 students who were being longitudinally tracked took the following 'next step': 25 are pursuing advanced degrees in STEM disciplines, 2 accepted STEM positions at NASA contractors, 44 accepted STEM positions in industry, 2 accepted STEM positions in K-12 academia, 7 accepted STEM positions in academia, and 15 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.
- Diversity: NCSG Affiliates include: 6 four-year baccalaureate through doctorate institutions, 5 four-year baccalaureate through masters institutions, and 1 four-year baccalaureate institution. (Of the 12 NCSG university Affiliates, 4 are Minority Serving Intuitions. Furthermore, the NC Community College System is an Affiliate and is comprised of 58 two-year associate degree granting institutions. All students and faculty attending a NCSG Affiliate institution were eligible to receive NCSG support in FY11. Of all students receiving direct support, 30.1% were minority students and 25% were female.
- Minority-Serving Institution (MSI) Collaborations: NCSG has 4 MSIs that are active Affiliates of the consortium: Elizabeth City State University (ECSU), NC A&T State University (NCA&T), NC Central University (NCCU), and Winston-Salem State University (WSSU). Each of these universities received funding from NCSG in FY11 to implement programs on their campuses that contribute to NASA and NCSG.
  - ECSU: awarded one Undergraduate Scholarship through NCSG competition (Outcome 1); supported 3 student research scholarships (Outcome 1); hosted an in-service teacher professional development workshop on planetary geology (Outcome 2); provided funds for Port Discover Science Museum to implement astronomy programs (Outcome 3).
  - NCA&T: awarded a Graduate Research Scholarship to a student to participate in the NASA LARSS program (Outcome 1); supported senior aerospace design activities

and team participation in the Lockheed Martin/SAE Aero-Design competition (Outcome 1); hosted a one day aerospace workshop for students in the Talent 21 summer program, an academic enhancement project at NCA&T funded by the NSF HBCU Undergraduate Program (Outcome 3).
  - NCCU: supported 5 minority students in hands-on research activities mentored by faculty (Outcome 1); awarded one New Investigator's Research award to an early career faculty member (see Program Accomplishments – Outcome 1).
  - WSSU: awarded two Undergraduate Scholarships through NCSG competition (Outcome 1); provided support for 12 students to present their research at national professional conferences (Outcome 1); provided support to expand undergraduate curricula in the Space Sciences Option component of the Computer Science degree program to allow for online participation by students from other campuses (Outcome 1); student-led outreach in the local community (Outcome 3).
- NASA Education Priorities: NCSG accomplishments related to the "Current Areas of Emphasis" include:
  - Authentic, hands-on student experiences in science and engineering disciplines: project examples described in 'Program Accomplishments – Outcome 1.'
  - Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise: 3 projects funded that support middle school professional development (described in 'Program Accomplishments – Outcome 2').
  - Community Colleges: the NC Community College System (NCCCS) Campus Director visited campuses with STEM-related degree programs throughout the summer and fall of 2011 to directly promote NCSG programs to existing and potential students. The result was a seven-fold increase in the number of applications and awards. The NCCCS NCSG program also supports aeronautics activities associated with the Mobile Launch Pad outreach across the state (described in 'Program Accomplishments – Outcome 3').
  - Aeronautics research: Faculty at NCSG Affiliate institutions are actively engaged in research related to NASA's Next Generation Air Transportation System and engage students in research activities (with collaborations at NASA centers, industry, and the National Institute of Aerospace). NC A&T State University's NASA funded Center for Aviation Safety (CAS) conducts engineering research and education in three major areas (Advancing Composites and Structures; Integrating Vehicle Health Management and Advancing Aeromechanics and Propulsion) to address the challenges of NASA's Aeronautics Research Mission Directorate's Fundamental Aeronautics and Aviation Safety Programs. NCA&T's CAS faculty served as mentors for a NASA Flight Fellowship (described in 'Program Accomplishments – Outcome 2').
  - Environmental Science and Global Climate Change: NCSG provided funds to support a 'New Investigators' faculty research project that is investigating mineral oxidation in cave systems in the southern Appalachian mountains and its linkage the Martian environment. NCSG also provided funds to support the development of an environmental science course that uses NASA imagery to perform geospatial analyses related to land cover change.

- Diversity of institutions, faculty and student participants: as described in NCSG Goal 4, a common thread throughout all programming areas is to increase the participation of women, underrepresented minorities, and persons with disabilities. The composition of NCSG Affiliates (4 of which are Minority Serving Institutions) provides opportunities for minority populations to engage in NCSG programs. In FY11, 30.1% of student receiving direct support were from underrepresented minority groups and 25% were female. Furthermore, of the 27 faculty receiving direct NCSG support, 29.6% were females.
- Enhance the capacity of institutions to support innovative research infrastructure activities: the NCSG 'New Investigators' program is designed to strengthen North Carolina's aerospace-related research infrastructure by providing startup funding to early career university faculty who are conducting research that is directly aligned with NASA's Strategic Framework. Four 'New Investigator' projects were awarded in FY11 (described in 'Program Accomplishments – Outcome 1').

'Summer opportunities for secondary students on college campuses' was the only area of emphasis not addressed in FY2011.

IMPROVEMENTS MADE IN THE PAST YEAR

- NCSG hosted the 2011 Southeastern Regional Space Grant meeting in the Research Park in September, 2011. Sixty people attended the meeting including representatives from eight (of nine) states in the SE region, NASA Headquarters, NASA Langley, and NASA Marshall. The theme of the meeting was "Linking Higher Education, Industry and K-12 Communities" and featured NCSG-funded faculty and student speakers.
- FY11 was the first full year for NCSG's newest Affiliate, East Carolina University. During FY11, ECU piloted a new student scholarship program for pre-service teacher education majors. ECU also hosted a series of five symposia to introduce students to research opportunities on campus (Extreme Space; Astrobiology; Life Support in Space; STEM Education; and Engineering research in aerospace power, telemedicine and water resources). This series was very popular on campus and brought awareness to the interdisciplinary research being conducted at ECU. Other NCSG Affiliates are planning to replicate this symposia model in FY12.
- NCSG increased its outreach efforts across the consortium to bring awareness of student opportunities. The result was a 66% increase in the number of applications submitted to the FY11 Fellowship and Scholarship competition.
- NCSG leveraged an additional $80,000 beyond its core Fellowship and Scholarship funding to support student internships in aerospace industry.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

NCSG has an organizational structure that enables each Affiliate member to play a significant role in project development and implementation of programs. Overall direction, policies, rules of governance, and budgetary priorities are established through

consensus by the Consortium Executive Board, which consists of the NCSG Director and Campus Directors from each of the following thirteen Affiliate institutions:

Appalachian State University is a 4-year, Baccalaureate and Master's degree granting public university. ASU facilitates programs that contribute to NASA Education Outcomes 1-3.

East Carolina University is a 4-year, Baccalaureate, Master's and PhD degree granting public university. ECU facilitates programs that contribute to NASA Education Outcomes 1-3.

Elizabeth City State University is a 4-year, Baccalaureate degree granting public university and is classified as a HBCU. ECSU facilitates programs that contribute to NASA Education Outcomes 1-3.

Duke University is a 4-year, Baccalaureate, Master's and PhD degree granting private university. Duke facilitates programs that contribute to NASA Education Outcome 1.

North Carolina Agricultural and Technical State University is a 4-year, Baccalaureate, Master's and PhD degree granting public university and is classified as a HBCU. NCA&T facilitates programs that contribute to NASA Education Outcomes 1 and 3.

North Carolina Community College System is comprised of 58 campuses across the state; 2-year Associate degree granting institutions. The NCCCS facilitates programs that contribute to NASA Education Outcomes 1 and 3.

North Carolina Central University is a 4-year, Baccalaureate and Master's degree granting public university and is classified as a HBCU. NCCU facilitates programs that contribute to NASA Education Outcome 1.

North Carolina State University is a 4-year, Baccalaureate, Master's and PhD degree granting public university. NCSU facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Asheville is a 4-year, Baccalaureate degree granting public university. UNCA facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Chapel Hill is a 4-year, Baccalaureate, Master's and PhD degree granting public university. UNCCH facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Charlotte is a 4-year, Baccalaureate, Master's and PhD degree granting public university. UNCC facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Pembroke is a 4-year, Baccalaureate and Master's degree granting public university. UNCP facilitates programs that contribute to NASA Education Outcomes 1-3.

Winston-Salem State University is a 4-year, Baccalaureate degree granting public university and is classified as a HBCU. WSSU facilitates programs that contribute to NASA Education Outcomes 1 and 3.

In addition, partnerships with industry, government and nonprofit agencies help NCSG achieve its strategic goals and objectives. Consortium partners include:

Industry Partner:
LORD Corporation is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies. Operating from world headquarters in Cary, North Carolina, LORD Corporation has 17 manufacturing facilities in nine countries and 90 strategically located sales and support centers worldwide. NCSG partners with LORD to offer the NCSG/LORD Corporation Summer Internship program. Since 2008, 30 students have participated in the program, which is fully funded by LORD. LORD contributes to NASA Education Outcome 1.

Education Partners:
North Carolina Science, Mathematics and Technology Center (SMT) promotes innovation in science, mathematics, and technology learning in the state's elementary and secondary public schools. NCSG partners with the SMT Center to implement the NASA Flight Fellows program. SMT contributes to NASA Education Outcome 2.

Kenan Fellows Program (Kenan Institute for Engineering, Technology & Science) promotes teacher leadership, addresses teacher retention and advances K-12 science, technology and mathematics education. NCSG partners with the KFP to implement the NASA Flight Fellows program. The KFP contributes to NASA Education Outcome 2.

Pisgah Astronomical Research Institute (PARI) is a not-for-profit foundation dedicated to providing hands-on educational and research opportunities for a broad cross-section of users in science, technology, engineering and math (STEM) disciplines. NCSG partners with PARI to provide opportunities for students to conduct astronomical and/or engineering-based research projects. PARI activities contribute to NASA Education Outcome 1.

North Carolina Museum of Natural Sciences (NCMNS) is a state-funded museum that provides opportunities for visitors to explore the natural world through hands-on exhibits and programs. NCSG annually participates in the museum's Astronomy Days event. NCMNS activities contribute to NASA Education Outcome 3.

Student Spaceflight Experiments Program (SSEP) is an initiative by the National Center for Earth and Space Science Education, in partnership with NanoRacks, LLC, that provides opportunities for students to design, build and fly experiments in low Earth

orbit. NCSG partners with SSEP to provide opportunities for NC middle school students to participate in the program. NCSG SSEP activities contribute to NASA Education Outcome 3.

Government Partners:
NASA Langley Research Center (LARC) provides opportunities for students and faculty to engage in aerospace research. NCSG activities at NASA LARC contribute to NASA Education Outcome 1.

University of North Carolina General Administration oversees the multi-campus university system composed of 16 public senior institutions of higher education and the NC School of Science and Mathematics. NCSG partners with UNCGA to ensure that strategic goals and programs align with North Carolina education priorities for higher education.